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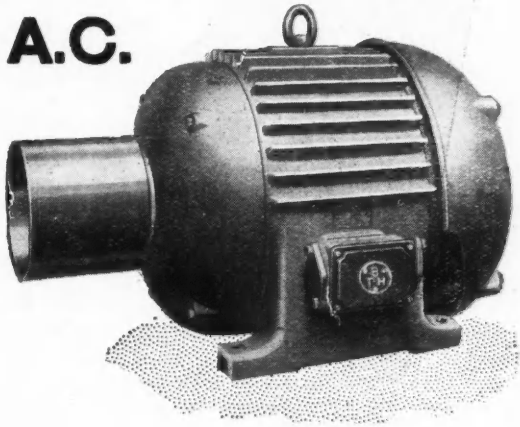

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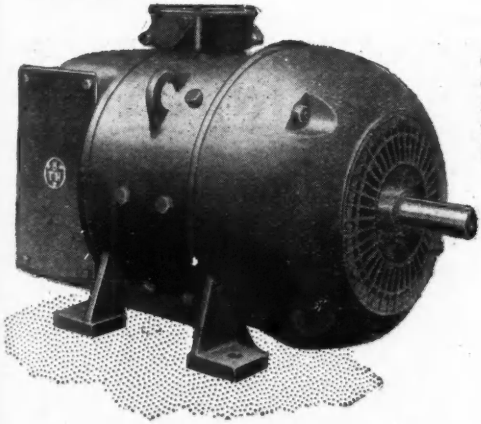

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This Troubled Old World

THE technologist may sit back, in theory, and watch the interplay ot political forces. There are many of these forces and, so far as their reactions affect him as an individual, he may take his choice whether he exerts himself or not. When politics, Big Business, and similar forces react on his technical sphere, he *must* sit up and take notice. It is for such reasons that we feel constrained to comment on international trade after the war, a subject that concerns every industrial and agricultural community. It is clearly of the utmost importance that trade should flow freely; that there should be as little violent change as may be possible; and that such competition as may occur in export markets shall be based on economic factors—cost of production and transport, technical quality, and so forth—and not upon the desire of individual nations for economic aggression or aggrandisement, or upon any other unhealthy urge.

The view has been widely expressed that the huge potential productivity of the U.S.A. will make her the dominant exporting nation of the world. It must not be forgotten, however, that the U.S.A. is a vast country, with a vast internal market, and that her achievements in cheap production with a high output per man-hour have been, and always must be, achieved under mass-production conditions, which involve repetition to a standard pattern or, in chemicals, a great and continuous output of one particular substance. Something of this view was expressed recently in a letter in the technical Press of the Iron and Steel Industry by an American editor, Mr. J. H. van Deventer.

"Britain is and must continue to be primarily an exporting nation. I find among your industrialists and business men and in your public Press somewhat of a spirit of defeatism as to your possibilities of post-war export trade. I also find that this feeling is based on the thought that the United States, with its enlarged plant capacity, will be a serious competitor in world trade. . . . But you are wrong or both counts. . . . Our own prosperity will be short-lived if yours is not also. . . Our own national security is inextricably linked with yours. America, with its large consuming population, has never been primarily interested in export trade. Our average pre-war exports have never exceeded 10 per cent. of our total production. And even should some of our more individualistic producers wish to adopt the ruinous policy of exporting their unemployment by

On Other Pages

dumping goods abroad, it will be most improbable that they will be permitted to do so. . . . The much-talked-about superior efficiency of American production. . . . applies to those mass-production products where demand is such as to permit of integrated mechanisation. . . . In small lots your costs are but 50 per cent. of ours, type for type."

This may be a soothing picture; but we must not forget that our costs for many goods are likely to be high if technologists do nothing about it. Labour is asking for more pay per hour (or a shorter working week, which comes to the same thing). The miners' wages in the U.S.A. are said to have been double ours in 1939, but their cost of coal per ton was 8s. 6d., against our 16s. That situation may be paralleled in other industries. It is a challenge to us as technical men to do something about it.

It is of the first importance to regulate international business to avoid the bad features of pre-1939 competition. The first effort to do this has been in the oil industry. As we recently pointed out (THE CHEMICAL AGE, September 23, p. 289), an agreement has been entered into between this country and the U.S.A. designed to regulate the oil business of the two countries. It is an open secret that the American oil interests ("Big Business") did not like the agreement, and Senator Connally has bluntly stated his doubts whether the Anglo-American oil agreement submitted to the Senate last August as a treaty would ever be ratified. This has caused a storm in the U.S.A. and has made us in this country realise that unless Governments control their national industrial bosses, the international situation may well get out of hand again. The Washington *Post* recalls that the treaty has been "lambasted by domestic oil interests that are more interested in taking profits in the next few years than in the long-range protection of our (American) petroleum resources," and it speaks of the Senate Foreign Relations Committee's failure either to hold public hearings or to prepare for them as "outrageous conduct" of a sort that has "undermined the confidence of other nations in the United States as a major factor in promoting world stability." The Washington *Star* considering the oil agreement as "to a considerable extent the test of our intentions," describes Senator Connally's prediction as "a heavy blow to hopes for a post-war world in which the United States would join with other nations to stabilise the production and conservation of basic commodities."

The Washington Correspondent of *The Times* is outspoken in his comments. Certainly, he says, the American oil industry has been pressing with all its weight against the ratification of the petroleum agreement, and it is possible with almost equal certainty to say that the American aviation industry is doing all it can to force upon other countries conditions of "tramp traffic" which might dangerously affect their own local and regional development and their future security. When to these is added the traditional American distrust of all that is resumed in the word "government," a force of unknown potency is disclosed.

There is another problem—again an Anglo-American one. In a recent leading article the New York *Herald-Tribune* asked: "What is to become of the $700,000,000 investment made by American taxpayers in the synthetic rubber industry . . . now producing 84 per cent. of pre-war consumption? What is to become of the 1½ billion dollars invested by the British and Dutch and the 2,000,000 persons who derived a livelihood from the Far East rubber if the United States meets its own rubber needs after the war? Here is a post-war economic problem of first magnitude. . . It has its counterparts in aluminium, shipping . . . international debts, etc." This problem is not new. It has occurred many times during the last century and a half when technical progress has supplanted a natural product.

On its solution depends the well-being and happiness of millions, and the desires of a few for big profits must not be allowed to influence whatever decisions are taken. The U.S.A. and the British Empire have a great responsibility to mankind. But it is necessary to ask what chances there are for the successful negotiation of a multilateral agreement to reduce trade barriers if highly protected groups of industrialists in either country—*e.g.*, the textile and machine industries and the farm bloc, in America—set their faces in the opposite direction.

NOTES AND COMMENTS

British Chemical Imports

NECESSITY of war has obliged us for so long to think of imports only as a means of increasing our military potential, that we have been inclined to forget that in normal times we are looked upon by many—by the United States, for instance—as an important sellers' market for chemicals. So much insistence has been laid on the importance of reviving and maintaining our export trade after the war that we have perhaps neglected the fact that trade goes both ways and that quite a number of worthy citizens make their living by importing goods into Britain. It does no harm occasionally to see ourselves as others see us, and a friendly and thoughtful article in *Chem. Met. Eng.* (October, 1944), which considers the British import market for chemicals, is well worth reading. It rightly states that the speed and extent of American supplies in wartime has evoked the admiration of many British manufacturers, and that the ease and matter-of-course way in which huge demands have been met have left a deep impression. United States chemical manufacturers have created for themselves a valuable goodwill which cannot fail to have great weight after the war, and the figures given on p. 587 of this issue are significant.

Co-operation and Emulation

THE Americans read our technical Press, and they are perfectly well aware of the growing importance that British chemical manufacturers now attach to research, especially to research on the development of our own home-produced materials; they have also not failed to notice that our Government has accepted the principle of helping industries, by means of tax allowances and even of subsidies, to develop new processes. Nevertheless, they are well aware that with their huge home market they can afford to go in for rapid expansion where often a British manufacturer would have to tread cautiously, and—perhaps most important of all—they have mastered the great principle of salesmanship that each customer needs to be treated in accordance with his individual peculiarities (here we could well take a leaf out of their book). A point that will interest many of our chemical manufacturers is that while co-operation between the big concerns on both sides of the Atlantic has been satisfactory, smaller firms have found it somewhat difficult to make use of potential opportunities in the other country. Here is an instance where the Trade Associations can come into play. They have been so successful in adapting the capabilities of small firms to war-time needs, that it seems reasonable to assume that they can prolong their beneficent activities when the time comes to change over to peace conditions. There will undoubtedly be great opportunities to be seized when peace eventually comes; where co-operation can help us to seize them it would be foolish to disdain it. The Americans, rightly, propose to neglect no chance. An American business man told Sir Oliver Simmonds (Conservative M.P. for Duddeston, Birmingham): "Some of you people make the mistake of thinking that because we are your Allies in arms today we have got to be your Allies in the export trade tomorrow. America proposes to roll up her sleeves and have a crack at it, and if Britain does not roll up hers, too, it is no good moaning diplomatically." For our part, we see nothing wrong in a little friendly emulation.

Reverse Lend-Lease

WHILE we are eternally indebted to the United States for the vast quantities of supplies that we have received under Lend-Lease arrangements, it is encouraging to know also that our contributions to the U.S. Army in the form of Reverse Lend-Lease aid have been far from negligible. President Roosevelt's 17th Report to Congress on Lend-Lease Operations contains an impressive summary of what has been done in this way, and has been reprinted by H.M. Stationery Office. A startling fact is that the British Commonwealth's expenditure on reverse lend-lease up to June 30, 1943, was 1175 million dollars: by June 30, 1944, it had almost trebled itself to 3348 million dollars. The huge increase is due to the preparations made for the liberation of Western Europe. It is not our function to

analyse the complete figures—this is done in the Report—but there are a few outstanding points of special interest to the chemical industry. Of the strategic commodity benzol, for example, the U.S. had received, up to June 30 this year, 70 million gallons; 6500 long tons of palm kernels and palm oil had reached them from British West Africa; and 78,000 tons of crude rubber from various quarters, among which Ceylon contributed 70,000 tons, more than two-thirds of her total output. Bailey bridges, jerri-cans, and sparking plugs in huge quantities go to swell the list. but the way in which the Americans have been aided by these and by many other (surprisingly varied) articles is another story, to be read in its proper place.

China and the West

AT a Press Conference, convened by the British Council on Friday last, Dr. Joseph Needham, F.R.S., head of the Council's Cultural Scientific Office in China, gave a most interesting account of the work he has been doing for the past two years to build up an organisation for scientific and technical liaison in order to keep scientists and technicians in China in touch with their colleagues in the Western United Nations. Dr. Needham is visiting this country for consultation, and he hopes to be returning to China soon. Driven by Japan's aggression, he said, the Chinese universities, concentrated in the coastal area, had had to be evacuated to the interior; but despite the limitations imposed by a war which had lasted since 1931, they maintained their high standard and trained many first-class scientists. The National Academy of Sciences, corresponding to our Royal Society or to the Moscow Academy of Sciences, has likewise an excellent record. In applied science, the chief organisations are the National Resources Commission and the Army Ordnance Administration. To mention a few examples of the work carried out, the geological and physical institutes have accomplished a great deal of work on the magnetism of the earth and on prospecting for minerals; the engineering institute has erected and operates an electrical steel plant in Yunnan; and work is in progress on malaria control by means of fishes which eat mosquito larvæ. Some progress has also been made in oil production, in the manufacture of power alcohol, and in the cracking of tung oil.

Need for Equipment

THE lack of equipment and instruments of every description is the chief obstacle in the way of China's scientists. Perhaps the most essential part of Dr. Needham's work is to supply and to distribute scientific apparatus. In reply to a question put by our representative, Dr. Needham said that up to 200 crates of instruments, valued at about £30,000, had been distributed, while similar funds were in hand for future needs. It is significant that the instruments supplied come from India, where fine chemical balances, Pyrex glass, and other items are now being manufactured in satisfactory quality. It must be emphasised, however, that this is in no way a charity, as China is paying for what she gets; yet she would not get as much—however limited it may be—were it not for the unceasing efforts of Dr. Needham, his wife, and his team of scientists. This does not exhaust the work of the office; it acts also as a clearing-house for scientific information between West and East, transmitting memoranda, and supplying books and scientific journals. In some of these activities, the office has established friendly co-operation with the Americans, who have no such centre, but who have sent out from 20 to 30 experts to advise the various ministries on scientific and technological matters. Dr. Needham's office also establishes contacts between Chinese and Indian scientists, thus linking the present with a period many centuries ago, when cultural and scientific contacts between the two peoples were close. However, it would be wrong to assume that all these activities are in an east-bound direction only; for the Chinese assist their Western colleagues in many ways, *e.g.*, papers by Chinese research workers have just been transmitted through Dr. Needham's office for publication in western scientific journals. Silk for parachutes, certain types of radio apparatus, and vaccines made in Chinese laboratories have been made available, by way of return, to the Western Allies.

Thermal Methods for Hydrogen Production

III. The Use of Natural Gas

by D. D. HOWAT, B.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E.

(*Continued from* THE CHEMICAL AGE, *December 16, p. 565*)

DESIGN of a typical plant using a purified gas mixture substantially free from hydrogen sulphide is shown in Fig. 8. Supplied to the plant at a pressure of 800-1300 mm., the gas is forced by the booster fan through a train comprising a saturator, heat exchangers, reaction vessels or converters, and coolers. In large plants the booster may be driven by a steam turbine, as the waste steam from the latter may be used to great advantage in the process. Passing through the saturator, a welded steel tower packed with stoneware or porcelain pieces of 60-100 mm., the gases are heated to 75-85° C. by contact with hot water, becoming saturated to 1-3 per cent. by carrying off entrained spray. Leaving the saturator, the gas mixture carries only about 50 per cent. of the water vapour required for conversion, the remaining 50 per cent. being added by the injection of live steam. With a steam/carbon-monoxide ratio of approximately 6, the gases then pass through two heat exchangers in series, and flow thence to the first converter. With very pure gases and a highly efficient catalyst the temperature on entering the first converter may be as low as 400° C., but with the more robust catalyst used for ordinary gas mixtures a starting temperature of 470-480° C. is necessary. With the heat of reaction the gases in the first converter increase in temperature by 100-150° C. The exit gases, containing 4-6 per cent. carbon monoxide, pass through the second of two heat exchangers preheating the incoming gas-steam mixture. Cooled to about 420-450° C. in the exchanger, the partially converted gas mixture then enters the second converter, emerging thence only 10-20° C. hotter and passing to the first heat exchanger. As explained earlier, the exit temperature from the second converter should be as low as possible to ensure maximum conversion; under good conditions the gases at this point will carry only 2-3 per cent. carbon monoxide.

The converters are cylindrical vessels with a welded mild steel shell lined with refractory and containing 3-5 grids to support the catalyst. The second converter is made 15-20 per cent. larger than the first to compensate for the slower gas reaction velocities. Normally, the size of the converters is arranged to be 12-18 cu. m. per 1000 cu. m. of dry gas per hour. An activated iron oxide and chromium catalyst in pellet or cube form is employed. Quantities of catalyst required are estimated at 6000-9000 kg. per

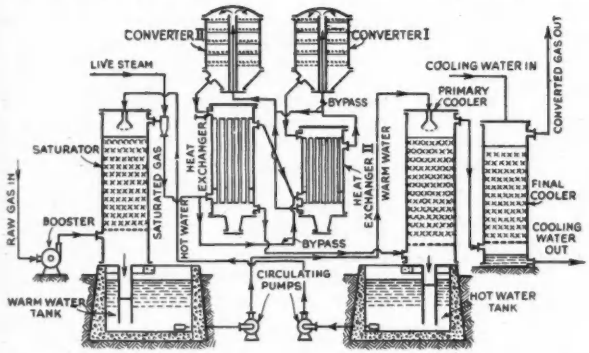

Fig. 8. Diagram of equipment for catalytic water gas conversion (Laupichler).

1000 cubic metres of dry gas per hour. From the first heat exchanger the converter gas mixture enters the base of the primary cooler, the function of which is to regenerate the excess steam remaining in the gases. Water withdrawn from the base of the saturator is used to cool the gases, and with careful control the temperature difference between the water entering and the exit gases from the cooler may be reduced to 2-3° C., the outlet temperature being about 74° C. In the final cooler the gas temperature is reduced to 25-30° C. by washing with cold water, the exit gases being supersaturated to 3-5 per cent.

Plant efficiency will be largely determined by the efficiency of the heat exchangers and recovering apparatus generally. The overall coefficient of heat transfer from raw gas to converted gas varies from 15 to 20 cal./sq. in./hour/°C. temperature difference in the gases. As the carbon monoxide content of the gases is reduced, increased precautions to avoid heat losses must be taken by insulating and lagging pipes and exchangers.

Efficient steam regeneration between the saturator and the primary cooler calls for close control. In the saturator the circulating water must be as hot as possible to reduce the quantity of live steam additions necessary before the the gases pass to the exchangers. As the excess steam required to effect rapid and complete conversion is about 600 per cent. a comparatively small drop in temperature in the saturator will increase considerably the quantity of live steam necessary; *e.g.*, gases leaving the saturator at 870° C. will remove 1030 gm. of water vapour per cu. m. of dry gas, a figure which decreases to 910 gm. at 85° C., *i.e.*, a decrease of over 11 per cent. for a 2° drop in temperature. Even under the best conditions, however, only about 55 per cent. of the total steam entering the plant is recovered in the saturator and 45 per cent. must be added as make-up steam. To give 600 per cent. excess steam to the gas mixture calls for an addition of 1.93 kg. of total steam per cu. m. of gas at N.T.P. (about 0.63 lb. of live steam per cu. ft. of gas at N.T.P.). The importance of steam economy is at once evident, published costs on the process indicating that, in a plant handling 5000 cu. m. of mixed gas per hour, steam consumption amounts to 43 per cent. of the total cost per hour.

In starting the plant from cold, heat is supplied from an additional combustion chamber. If the catalyst permits, hot combustion gases from the chamber may be passed directly through the converter, but if the catalyst is too fragile, hot air or superheated steam must be employed to raise the temperature in the converter. Once the starting temperature of the catalyst has been reached in one of the converters, gas and steam are admitted cautiously to increase the temperature by the heat of reaction. Great care is necessary to prevent the formation of hot spots in the catalyst during the early stages. Unless the temperature is controlled by reduction of the gas flow or by the addition of large quantities of steam, lack of homogeneity in the catalyst leads to the development of hot spots, causing eventual sintering and loss of activity.

The following table shows the percentage of conversion and the composition of the dry gases after conversion when the raw gases of composition shown in Fig. 7 are treated by the process using a steam/carbon-monoxide ratio of 6 and

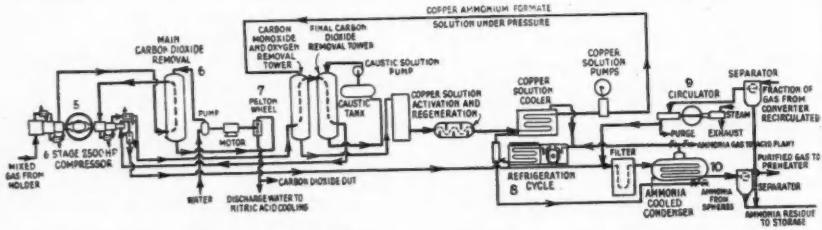

Fig. 9. CC_2CC purification train for hydrogen obtained by catalytic conversion of water gas (Miller & Junkins).

a maximum temperature in the second converter of 450° C.

	Per cent. conversion	Final volume at N.T.P.	Composition of the converted gases: dry basis %			
For Pure Hydrogen Production			CO	CO_2	H_2	Inert
Raw Gas:						
Pure CO	97.0	197.0	1.20	49.4	49.4	—
Water Gas	94.0	137.6	1.65	31.25	63.45	3.65
For H_2/N_2 Mixtures						
Raw Gas:						
Mixed Gas	94.5	136.8	1.53	32.1	51.04	15.33
Producer Gas	95.7	124.4	0.89	24.3	29.36	45.35

The carbon dioxide is removed by any of the well-established processes: by washing with water under a pressure of 25 atm. with removal of the last traces by absorption in sodium hydroxide solution; by the use of the ethanolamine absorption solutions; or by the phosphate process. After carbon dioxide absorption, each cu. ft. of carbon monoxide in the original water gas will be found to yield 0.94-0.96 cu. ft. of hydrogen of 92-95 per cent. purity.

When the hydrogen is to be employed in a catalytic process, the presence of 1.5-2 per cent. of carbon monoxide is inadmissible. Special plant must be installed for the absorption of the carbon monoxide in solutions of cuprous ammonium salts under pressure. The degree of purity required will largely determine the necessary washing pressure for carbon monoxide removal, plants operating in the range 25-300 atm. Residual carbon monoxide in the gases will be about 0.1 per cent. at 25 atm., but only 0.003 per cent. at 300 atm., the normal operating range being 100-200 atm. Fig. 9 shows the carbon-dioxide/carbon-monoxide absorption plant employed in conjunction with the catalytic conversion of carbon monoxide at the T.V.A. synthetic ammonia plant at Muscle Shoals, Alabama.[11] Carbon dioxide, comprising 28 per cent. of the exit gases from the converters, is scrubbed out by water at 17 atm. pressure. After passing through the scrubbing tower, the high-pressure water is passed through a Pelton water-wheel coupled direct to the pump shaft. In this way over 50 per cent. of the total power required to pump the high-pressure water is recovered from the exit water. Removal of the carbon monoxide, oxygen, and residual traces of carbon dioxide is effected by scrubbing at 121 atm. pressure with cold ammoniacal copper formate solution. Motor-driven hydraulic-type pumps force this solution to the top of the absorber tower, down which it flows counter-current to the gases, the gases passing thence to the caustic soda scrubber. Leaving the tower through a pressure breakdown valve, the copper ammonium formate solution then flows through a reflux scrubber to a reduction tank and thence to the regenerating tank. This tank is divided into a number of compartments by partitions for easy temperature control to ensure elimination of the absorbed carbon monoxide. From the regenerator the copper solution flows through a water cooler to the refrigeration plant, from which the cooled solution is recirculated.

A patented process for carrying out carbon monoxide conversion with steam at pressures of about 6-7 atm. with special low iron content catalysts has been claimed by the Austro-American Magnesite Company.[12] Although the equilibrium is independent of pressure, the patents claim that the higher pressure increases the reaction velocity to such an extent that the capacity of the reaction vessel may be reduced, the quantity of excess steam decreased, and the temperature in the second converter lowered. With the iron-oxide-base catalysts increased pressure has two undesirable effects: firstly, it caused excessive precipitation by the reaction:

$$2CO \rightleftharpoons CO_2 + C \quad \ldots\ldots\ldots\ldots \quad (5)$$

so much so that pipes and converters became clogged. Secondly, the formation of methane as a product of a side reaction was markedly increased. Magnesium oxide catalysts were developed for use in preference to the iron oxide type, the following composition being suggested:

	%
MgO (in the form of calcined or caustic burned magnesia)	13.5
Fe_2O_3 (as iron ore)	1.5
Potassium carbonate	15.0
Carbon	70.0

In the preparation of the catalyst mixture, wood charcoal is employed as the source of carbon, the mixture of reagents being compressed and heated to 800° C. for several hours in the absence of air.

The conversion apparatus is essentially the same as that described earlier, except that a booster is interposed just before the

saturator to raise the gas mixture to the required pressure of 6-7 atm. According to the patent claims, only about 200 per cent. excess steam is required in contrast with 600 per cent. at atmospheric pressure. A further advantage in the high-pressure process is the use of lower converter temperatures. The temperature in the first converter is maintained between 400 and 500° C., but in the second converter the temperature is kept at 320-400° C., preferably 350-370° C.

Decomposition of Natural Gas

The existence of abundant supplies of natural gas (about 80 per cent. methane and 15-18 per cent. ethane) in the U.S.A. has caused the development of several processes for the decomposition of these gases with steam, yielding hydrogen and carbon monoxide. Possible reactions involving the conversion of methane to hydrogen and carbon monoxide or dioxide are listed as follows by Berthelot.[13]

$CH_4 + H_2O$ (vapour) $= CO + 3H_2 - 50$ cal. .... (10)

$CH_4 + 2H_2O$ (vapour) $= CO_2 + 4H_2 - 40$ cal. ... (11)

$CH_4 + \frac{1}{2}O_2$ (vapour) $= CO + 2H_2 + 7$ cal. ..... (12)

$CH_4 + CO_2$ (vapour) $= 2CO + 2H_2 - 60$ cal.... (13)

Exothermic reaction (12) involves great practical difficulties in the control of temperature to avoid complete combustion, while reaction (13), occurring at 850-900° C., has not proved a commercial proposition. To effect reactions (10) and (11) efficiently on a commercial scale presents problems: first, in inhibiting the formation of olefines, acetylenes and aromatics; second, in providing suitable plant; and third, in discovering a catalyst which will reduce the theoretical minimum reaction temperature of 1200° C. by about 400-450° C.

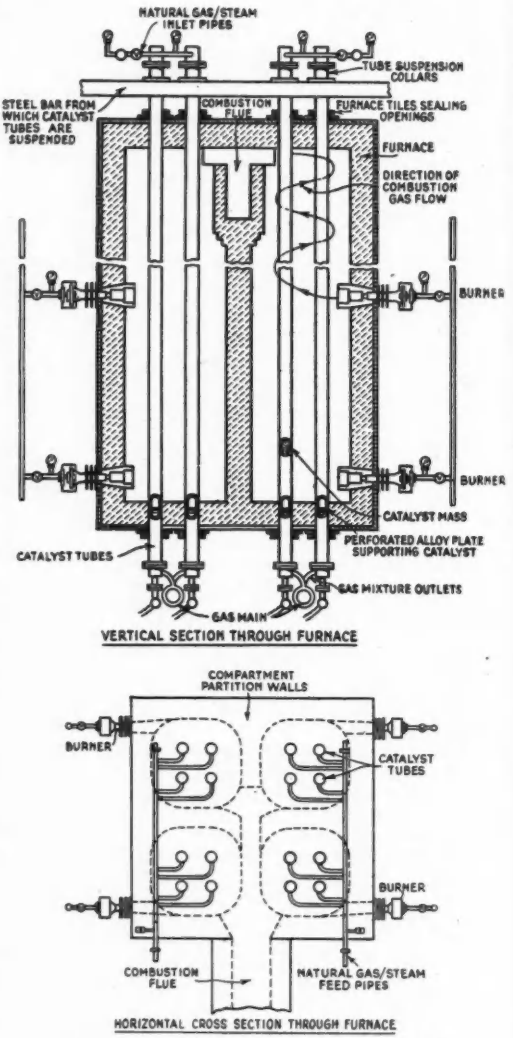

Fig. 10. Furnace for catalytic conversion of natural gas with steam (U.S.P. 2,173,984).

Many catalysts and various methods of preparation have been patented, but all involve nickel as the catalytically active metal.

Strength at high temperatures, and resistance to shrinkage and to poisoning

by the reaction products, are all vital factors in the choice of a suitable catalyst. Calcium and magnesium oxides and silica may be employed to give high temperature strength to the catalyst. The combination of phosphoric acid with nickel and magnesium produces a catalyst with great activity and only very slight shrinkage at high temperatures.

The catalysts may be prepared by briquetting, followed by reduction or by impregnating the carrier with a soluble salt of the active metal, the salt being subsequently decomposed and the oxide reduced. Previous roasting for 24-48 hours at a temperature of 200° C. above the actual operating temperature enhances the strength of the catalyst and reduces the tendency to shrinkage. By employing a suitable catalyst the operating temperature for reactions (10) and (11) may be reduced from 1200° C. to about 760° C., although the process is commercially operated at 850-1000° C.

Briquetted Catalyst

According to one patent[14] the catalyst is prepared by briquetting a 3:1 mixture of magnesia and nickel oxide with oleic acid or graphite, the briquette being heated in an oxidising atmosphere to a temperature in excess of 870° C. Subsequent heating in a reducing atmosphere produces fine particles of metallic nickel throughout the briquettes. A mixture of nickel and magnesium pyrophosphate in approximately equal proportions has also been claimed.[15] Shapleigh[16] prepares the catalyst by impregnating diaspore with nickel nitrate to contain about 6 per cent. metallic nickel. The material is heated to 260° C. to decompose the nitrate, the nickel oxide being subsequently reduced to metal, the final particles varying from $\frac{3}{8}$ in. to $\frac{5}{8}$ in.

Production of hydrogen from natural gas by reaction with steam is normally carried out in two stages. In the first stage, the endothermic reactions (10) and (11) take place with the formation of hydrogen and carbon monoxide, temperature required being 850-1000° C. The catalytic conversion of the carbon monoxide with excess steam constitutes the second stage, the temperature required being only 400-600° C.

In decomposing natural gas with or without steam the process may be carried out either continuously or intermittently. Owing to the high temperatures which must be maintained, the process was originally carried out intermittently, the mixture of natural gas and steam, or the natural gas alone, being circulated through chequer brickwork previously heated by the combustion of another portion of the gas. Rosenstein[17] describes the process employed in a synthetic ammonia plant to produce hydrogen from natural gas without the use of steam. Chequer brickwork is heated to 1100° C. and natural gas is then passed through until the temperature falls to 900° C. The exit gases, carrying 70 per cent. hydrogen, 5 per cent. carbon monoxide, and 0.5 per cent. carbon dioxide, together with undecomposed methane, are purified from tar and graphite by scrubbing with water. Oil-scrubbing removes the benzol while the carbon dioxide is eliminated by caustic soda solution. Finally, the hydrogen is extracted in a state of high purity by condensing out all the remaining constituents in a Linde gas liquefaction plant. A recent patent[18] describes a plant comprising an upper zone of chequer brickwork with a lower deep bed of solid carbonaceous fuel at red heat. The natural gas mixture is forced in turn through the chequer zone and fuel bed and is re-circulated until the hydrogen is sufficiently pure for use in hydrogenation processes. If successful, this new patented development will permit the cracking process to be carried out continuously

Another proposal to use an incandescent coke bed is incorporated in a German patent[19] claiming the employment of a two-compartment furnace, the two compartments operating alternately. To raise the temperature of the bed to 1300° C., oxygen with varying quantities of steam is injected at the bottom. During this time the methane/steam mixture is introduced at the top of the second compartment. After a given period the flow of the gas mixtures through the two compartments of the furnace is reversed.

The Continuous Process

The nature of the intermittent process does not favour the use of a catalyst, but partially successful attempts have been made to incorporate a catalytic material in the actual chequer brickwork.

Two factors have combined to bring about the development of a continuous

process for the production of hydrogen from natural-gas/steam mixtures. These are: First, the discovery of catalysts with the required activity, strength, and resistance to poisoning, for operation at high temperatures; and second, the production of special alloy tubes possessing the required mechanical strength and resistance to scaling at the temperatures involved. Although the temperature required inside the tubes is only 850-1000° C., the really severe ordeal is contact with the actual burner flame, which may be about 1700° C.

Avoiding Mechanical Stress

To avoid unduly severe mechanical stresses the alloy tubes packed with the required catalyst are arranged vertically in the furnace, being suspended from collars resting on independent steel supports. In the older designs excessive contact between the combustion gases and tubes was avoided by using the principle of parallel flow. In such a case the combustion space was made large and the tubes spaced widely apart, with the result that thermal efficiency was poor. More recent designs have employed burners located in the side walls of the furnace at various levels. From the burners the combustion gases pass into the furnace in a direction substantially tangential to the reaction tubes, with the main heating effect concentrated on the inner refractory walls of the furnace, and thence by radiation to the tubes. Tubes made from chromium/nickel/iron alloys are arranged vertically in the furnace, the tubes being secured from an independent steel bar and freely suspended to allow for expansion and contraction. Catalyst is packed loosely into the tubes and rests on a perforated alloy plate located near the bottom of the tube. In the design, shown in Fig. 10, the furnace is divided into four separate compartments, each containing four tubes and heated by independent burners. The direction of combustion gas flow and the method of supporting the tubes are also shown. According to the patent specification,[16] 2-6 sq. ft. of refractory wall radiating surface is required per sq. ft. of metal tube surface within the furnace, while the gas flow through the tubes is about 600 cu. ft. per hour per cu. ft. of catalyst. Preferably, the tube diameter should be 3-8 in., while the suggested tube length is 25-50 ft. Over 60 per cent. thermal efficiency is claimed for the furnace, in contrast to 35 per cent. with the parallel-flow design.

Thermal Decomposition of Natural Gas

Natural gas, refinery gas, or methane may be decomposed by cracking without steam to yield a mixture of carbon black and hydrogen. With the development of the synthetic rubber industry the market for carefully-graded carbon black has been greatly extended. Natural gas may be cracked in an ordinary water-gas generator. The fuel bed is "blasted" in the conventional "blue gas" procedure, but during the "run" portion of the cycle natural gas is circulated instead of steam.

According to Drogin[20] the Thermatomic carbon black process employs a furnace closely resembling the superheater of a water-gas generator. In operation the stack valve is closed and natural gas is led in at the top of the chamber and forced down through the brickwork previously heated to 900-1300° C. The hydrogen and about 50 per cent. of the carbon black produced leave through an exit valve at the bottom, the carbon black being separated from the hydrogen by bag filters. At the end of a short period the supply of natural gas at the top valve is cut off. Combustible gas, entering at the bottom, is burned to provide the heat required to bring up the temperature of the chequer brickwork for the next cycle. So far as the production of carbon black is concerned, the process is relatively inefficient. In general, thermal decomposition is uneconomic for hydrogen production without a good market for carbon black.

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Lend-Lease Chemicals

Comprehensive Statistics Released

IN recent issues of THE CHEMICAL AGE, reference was made to Lord Keynes's Washington mission connected with the future of Lend-Lease, as well as to Mr. Churchill's statement in the House about certain changes in the vast complex of Anglo-American economic relations. Although seventeen reports on Lend-Lease operations and reverse Lend-Lease Aid have been issued both here and in the United States, no figures have so far been published showing chemicals supplied under Lend-Lease.

In response to a special request from *Chemical Industries,* the U.S. Foreign Economic Administration prepared the appended table of exports of chemicals and related products to all countries for the period from March, 1941, to April, 1944.

These statistics show that the United Kingdom was the chief recipient of chemical Lend-Lease products, followed by the U.S.S.R. as a close second, with the Middle East third. Explosives and industrial chemicals are the two main groups of products supplied; out of a grand total of explosives worth $215,364,447, the United Kingdom received $89,038,834 and Soviet Russia $104,372,419. These two countries obtained over four-fifths of all industrial chemicals exported; out of a total of $150,671,093, this country received supplies worth $68,021,169 and the Soviet Union $63,522,458. In the case of the Middle East and adjoining territories, chemical specialities and explosives account for over half the total of $45,058,275. As a whole, exports of chemicals and related products under Lend-Lease averaged $176,600,000 per annum, compared with an average of $144,766,000 for 1930-39. In the period 1920-1929 the annual value was $174,977,000.

The Future Outlook

These figures, however interesting by themselves they may be as an indication of the extent to which United States chemicals have entered foreign markets, should, in a future report, be supplemented by quantitative figures for the main classes of chemicals. It is significant that, as pointed out above, Lend-Lease exports under this head are only about $1,600,000 above the average for the nine years following the last war. Among the reasons for this development, the rise of national industries in many countries which followed policies of "self-sufficiency" is probably the most important. Bearing this in mind, it remains to be seen whether the United States export target for chemicals and related products, set at $276,900,000 for the year 1948, will be compatible with world requirements, not to mention capacity to pay.

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LEND-LEASE EXPORTS OF CHEMICALS AND RELATED PRODUCTS FROM THE U.S. TO ALL COUNTRIES, MARCH 1941—APRIL 1944 (in dollars)

	United Kingdom	U.S.S.R.	Australia & New Zealand	Africa, Middle East & Mediterranean Area	India & China	Latin America	Other Countries	Total
Coal-Tar Products	4,315,546	21,116,613	576,352	365,740	327,724	427,976	2,282,328	29,412,279
Medicinal and Pharmaceutical Preparations...	12,740,135	15,339,283	2,545,548	7,791,887	6,829,137	152,087	972,397	46,370,474
Chemical Specialties	24,741,492	6,489,931	2,788,875	14,617,357	1,759,601	156,327	4,882,321	55,435,904
Industrial Chemicals	68,021,169	63,522,458	3,688,017	5,247,930	2,226,795	291,889	7,672,835	150,671,093
Pigments, Paints and Varnishes ...	7,437,820	378,054	924,598	1,975,390	1,551,846	94,458	136,762	12,498,928
Fertilisers and Fertiliser Materials ...	15,910,055	125,943	439,690	1,303,645	118,161	822	179,059	18,077,375
Explosives, Fuses, etc.	89,038,834	104,372,419	1,880,988	13,156,248	3,389,984	175,447	3,350,527	215,364,447
Soap	5,430	1,124,673	1,207	593,540	419	290	137,811	1,863,370
Toilet Preparations	—	—	—	6,265	—	—	27,361	33,626
Total	222,210,481	212,469,374	12,845,275	45,058,002	16,203,667	1,299,296	19,641,401	529,727,496

LETTER TO THE EDITOR

Can the Scientific Instrument Industry be Safeguarded ?

SIR,—In a recent issue of THE CHEMICAL AGE there appeared an abridged report of the meeting convened by the London section of the British Association of Chemists, dealing with the safeguarding of "Master Key" industries and, more particularly, the scientific instrument industry. The question has been asked: "Can this industry be safeguarded by legislaton, or would attempts to do so bring about a sort of black market in scientific apparatus?" This query is probably prompted by past experience, and it can best be answered by a brief examination of previous practices.

At the beginning of the last war it was realised that we were too dependent on certain foreign countries for some essential forms of apparatus, and the Key Industry Duties were introduced to give British manufacturers a measure of protection, and thus a sufficient market to ensure efficient quantity production and encourage new development. These duties were applied *ad valorem*, and on what seemed to be elaborate and very complete schedules. However, the Customs Service must have had some difficulty with the language of instruments, as the terms used are not universal, and they must have had their troubles when checking complicated and, to them, unknown pieces of apparatus against invoice and shipping details, but, in the main, they did their job quite well.

As time went on, and international business became more and more competitive, some of the larger manufacturing organisations abroad began to seek ways and means of circumventing the duties. One of the easiest methods proved to be shipping parts of instruments and assembling them here. Now if the Customs man had difficulty with complete instruments, he certainly was in even deeper water when dealing with parts, and could scarcely be blamed when instrument clocks were advised as "chart motors." After all, they had no hands, and did not tell the time in the ordinary way. So instrument clocks came in duty free. Capillary tube for vapour-pressure thermometers came in as "copper tube," and free of duty. Instrument cases could bear a nameplate referring to a type not subject to K.I. Duties, but nameplates are easy to change. One way and another, the practice of shipping parts achieved the object in view.

Later, as tariff walls were built round an increasing number of countries, the countermeasures became more open and on a larger and more complete scale. A product or, if necessary, an entire industry, would be subsidised to the point where an *ad valorem* Key Industry Duty could be paid, honestly and in full, but leaving the product at a selling price below that of a non-subsidised home-produced article. An example is the instrument clock already referred to. These were produced in the Black Forest area, shipped to this country, and sold at about half the cost of a clock manufactured here. So it is not surprising that the majority of industrial recorders made in this country, between the wars, used German clocks. The result was the one desired by the subsidisers—a considerable hold-up in deliveries of instruments required for essential war purposes, while British firms embarked on instrument clock manufacture.

Ad valorem duties remained as a revenue-producing tax, failing to give the necessary protection to our Master Key industries, and invoking retaliatory measures until the urgent necessity to conserve foreign currency arose at the beginning of the present war. They were then dropped in favour of the Import Licence. This has proved easy to operate, and no amount of ingenuity has succeeded in getting past it when the administrators have said "No!" The guiding principle has been: "If there is anything available in this country which will do the job, it must be used even if it does not do the job quite as well as something you could import." There cannot be much quarrel over that attitude in war time, but it needs a little modification in times of peace, otherwise our scientists might find themselves working with inferior tools, or our manufacturers with less efficient machinery. So the criterion for a licence must be such that anything new in instruments or research apparatus can be allowed into the country without undue difficulty in proving a case for importation. Also there must be no delay or increase in cost.

It may be argued that such measures would result in indolence and inefficiency among the instrument firms in this country. This is not likely to be the case; inventive minds must find expression, and the man, or as it more usually is, the team, who can produce new and better instruments will not cease to function, and a protected industry will be able to afford greater expenditure on development to aid their effort. The great expansion of the German optical instrument firms started when they were guaranteed their home market. Similarly, the firms in America went ahead in the same circumstances.

Another factor is that many instruments are invented by the user. He is, of course, in the best position to know what is needed, and to study the conditions of use, so it is not surprising if he produces a good device which the manufacturer is often glad to take up. If the manufacturer became indifferent, as a result of protection, the inventor would make his device himself, and

in the long run the necessary corrective measure would be brought about. Indeed, the writer is aware of a number of cases where this has been done owing to the inability of the instrument industry to undertake any more work under present conditions.

To sum up, it is submitted that an *ad valorem* duty has been tried, and that it has failed. It should not, therefore, be re-introduced. Import licences have achieved their war-time objective, can be satisfactorily operated and could, with a slight adjustment in policy, be applied to the safeguarding of our Master Key industries in peace time. The administration of this scheme, as far as instruments are concerned, might be assisted by a technical tribunal, versed in the art, and able to advise the authorities if and when there was a case for granting a licence. This might consist of two users of scientific apparatus, two manufacturers, and a presiding government official.—Yours faithfully,

L. B. LAMBERT,
Negretti & Zambra, Ltd.

China's Chemical Industry

Interview with Dr. Joseph Needham

AN interesting account of developments in Free China's chemical and metallurgical industries was given by Dr. Joseph Needham, F.R.S., who is on a flying visit to this country from China (as recorded elsewhere in our columns), in an interview with a representative of THE CHEMICAL AGE. Dr. Needham laid special emphasis on the fact that the recent Japanese advances, aiming at the establishment of land supply lines between Indo-China and Manchuria, have not seriously affected Free China's industrial production, except for electrical machinery and radio equipment, as a result of the enemy capture of the Kweilin plant, the leading plant of its kind in the country, and of the cutting off of the tungsten deposits. Owing to the great foresight shown by the Chungking Government years ago the two far-western provinces of China can go on waging war for another two or three years; but the situation is undoubtedly grave, with the enemy at the gates. Nevertheless, it is Dr. Needham's opinion that he will not succeed in conquering the two western strongholds.

Oil Cracking

At Kunming a new lead chamber plant for the production of sulphuric acid is being erected; in Szechuan and Yunnan, some progress is being made in the production of soda ash. Great strides have been and are being made in the production, distillation, and cracking of motor fuel from mineral and vegetable sources, including the low-temperature carbonisation of pine stumps. The products thus derived play no insignificant rôle in keeping China's transport on the roads. Apparatus is being improvised in an incredibly ingenious way from old petrol drums of which there are millions in the country. The National Resources Commission, for instance, is making radio cabinets and other equipment from the metal obtained from these drums. There is as yet next to nothing in the way of organic chemical industry, owing to the concentration on low-temperature carbonisation processes. Hydro-electric work, however, is well under way, and there are underground power stations for which machinery is constantly coming in by air, and which will, in due course, provide power for a further development of the chemical industries.

Brine and Natural Gas

Natural brine, located at depths of some 3000 ft., is being used, after purification, for food purposes and for the production of borax, bromine, and other inorganic compounds on an increasing scale. These salt wells are situated near Tzuliushing, a name meaning "the self-flowing wells." Hundreds of wells are still operated by the old methods with buffalo-driven boring machinery. It takes from 20 to 25 years to drill a well by these traditional methods, but electric gear, Dr. Needham pointed out, is now coming in, too. Natural gas, associated with the brine, is being successfully used in the evaporation processs and, compressed in cylinders, for motor propulsion of the Yangtse ferry-boats.

In metallurgy, there are as yet no new developments. This hardly comes as a surprise owing to the incredible difficulties connected with the establishment of any plant, owing to the lack of power, water, and transport which compels every plant to be practically a self-contained unit. However, Dr. Needham mentioned that a brilliant metallurgist, Mr. Yeh Shu-Pei, is engaged on researches on the sponge-iron process which may facilitate the utilisation of low-grade iron ores.

The Chinese are producing good refractories and have installed some electrical induction furnaces. They also make excellent acid-resistant stoneware, good glass, and exquisite pottery.

It is to be hoped that Dr. Needham's observations will drive the lesson home that conditions in China have to be viewed from a point of view entirely different from the usual Western attitude, if we are to avoid wrong and unfair conclusions.

American Notes

Trichlorocumene

PRODUCTION of trichlorocumene (isopropyl trichlorobenzene) $CH_3)_2.CH.C_6H_2Cl_3$ has been taken up by Hooker Electrochemical Co., Niagara Falls, New York, in their pilot-plant. This substance is obtained as an isomeric mixture and is a colourless liquid with a mild aromatic odour. It is insoluble in water, but soluble in other common solvents. It shows high stability both to oxidation and hydrolysis, and can be used with a wide range of plastics, rosin, natural asphalt, polyvinyl chloride, etc. Many possible uses for the new product are being suggested: *e.g.*, as a hydraulic fluid, transformer and dielectric fluid, as a solvent for fats, oils, coal-tar dyes, or as an extractant and plasticiser. Its molecular weight is 223.5; its boiling range 245°-265° C., and its specific gravity 1.26-1.32.

Phthalate Insecticide

Several species of insects, including mosquitoes, flies, fleas, gnats and sandflies, are destroyed by dimethyl phthalate, a material hitherto most often used as a plasticiser. Du Pont, who are making this material, state that supplies are allotted to the Army, but the company foresees its civilian use after the war.

Economising Zinc

Another development by du Pont concerns a new method of preventing the loss of metal from the zinc anodes in plating baths during off hours—by passing a weak current in a direction opposite to the plating current. A small counter current applied between a zinc anode (as cathode) and a steel plate in the bath (as anode) is highly effective in eliminating chemical attack of the zinc. For most installations only a two-volt storage battery, charged constantly with a small rectifier, suffices. The total current required for a 1000-gallon still tank is approximately 1½ amperes, and a 1000-gallon barrel tank with more anodes requires about 2½ amperes. In effect, the counter current neutralises the natural tendency of zinc—chemically a highly active metal—to dissolve

Sodium Methylate

Available Commercially in U.S.

COMMERCIAL sodium methylate, a dry white powder containing a minimum of 95 per cent. $NaOCH_3$, not over 2 per cent. inorganic alkalis (sodium hydroxide and sodium carbonate), and not over 3 per cent. methanol, is now available in the United States. The apparent density of the powder is about 0.4. It dissolves in about twice its weight of methanol. An account of its preparation and properties is contributed by G. D. Byrkit and E. C. Soule, of the Research Department, Mathieson Alkali Works, Niagara Falls, N.Y., to *Chem & Eng. News* (1944, *22*, 21, p. 1903).

The product absorbs moisture and carbon dioxide from the air, reacting to give sodium hydroxide and sodium carbonate respectively. It also reacts with the oxygen of the air to form sodium hydroxide, sodium carbonate, and sodium formate. Samples of sodium methylate which have been exposed to the air will therefore contain such alcohol-insoluble materials. The reactions forming these products are exothermic, especially that with atmospheric oxygen; excessively exposed sodium methylate therefore constitutes a fire hazard. Any fires are readily extinguished with soda ash, sand, or, if small, with large quantities of water.

Sodium methylate is caustic to skin and mucous membranes; areas with which it has come in contact should be promptly treated with copious quantities of water followed by dilute acetic acid.

The powder is furnished in air-tight containers and the entire contents of the container should be used once it has been opened. For this reason a variety of container sizes is available. With proper precautions, sodium methylate is no more hazardous than alcohol and anhydrous caustic soda.

Compounds of commercial importance which may be made by methods involving the use of sodium methylate include pharmaceuticals (atebrin, barbiturates), perfumes (ionone, indol), metallic soaps, and dyestuffs (chrome red B, Hansa yellows, methyl violet) and intermediates. Of particular importance are sulphadiazine and sulphamerazine, since commercially satisfactory yields are dependent upon the use of sodium methylate of relatively low alcohol and sodium hydroxide content. Other products include vitamin B_1, acetoacetic ester, alkyl malonic esters, ethyl orthoformate, etc.

South African engineering works have just completed important rolling mill spares for the Karabuk Steel Works in Turkey. The order was undertaken at the request of the British Government, which, when the Turkish requirements became known, indicated that in the interests of shipping economy the order could not be fulfilled by Britain. The steel output of the Karabuk Mills, which are Turkey's only steel mills, was seriously hampered by lack of spares, the chief of which were steel rolls, valves and cylinders, various types of wire rope and a large variety of pinion shaft gears. Execution of the order occupied a total of about 20,000 working hours.

Training for Industry

Physicists discuss Selection of Personnel

At the discussion on "The Selection and Training of Personnel for Industry," held under the auspices of the London and Home Counties' Branch of the Institute of Physics on December 2, with Dr. S. Whitehead in the chair, a stimulating address by Major F. A. Freeth, F.R.I.C., F. Inst.P., F.R.S., of I.C.I., Ltd., opened the proceedings. Major Freeth has had many years' experience of selecting and training personnel, and his address contained many practical suggestions for the education and training of scientists for industry. Among the special points to be kept in mind, he said, were that interviews should be kept as informal as possible and pains taken to make the candidate feel at his ease. Allowances should be made for the effect of the war upon his educational career; and sympathetic consideration should be given to a man who had not had much chance of general education and experience of the world.

Within industry itself, scientific and intellectual enthusiasm should be encouraged; when possible, by the stimulus of travel and visits to scientific and technical conferences. The man in industry should be encouraged to be on particularly good terms with his counterparts in the universities. Men whose performance in university examinations had been poor should not be overlooked, as occasionally success in examinations proved to be no more than a feat of memory.

Major Freeth commended the selection work of psychologists in this war and thought that every encouragement should be given to them to assist in industrial recruitment.

A man's education, he thought, should be regarded as having for its purpose "getting him into a frame of mind where he will go on building up on himself for the rest of his life. The other end of the scale," he said, "is the man who on obtaining his degree, says: 'I'm qualified,' and potters along till he reaches his grave." He had never been happy about the Ph.D. degree, and he pleaded for more training in the writing of clear English.

Education for Leadership

In the general discussion which followed, a representative of a large electrical engineering firm suggested that the industrial physicist should serve an apprenticeship similar to that expected, for example, of engineers and architects; and he urged universities and technical colleges to educate men for leadership rather than for narrow vocational work. The great advantages accruing from contact with industry as part of a training scheme were pointed out and a "sandwich" system of up to five months in industry each year was recommended.

Another speaker from a large industrial concern said that the attitude of some universities was "industry must take whatever we offer," but this view was challenged, and several other speakers from industry stated that they did not expect entrants to their organisations from universities and technical colleges to be employed on productive work until they had gained the special training and experience requisite for their particular industry—a matter of six months or more. They wanted the universities and colleges to provide them with good scientists having broad rather than deep knowledge, and they would attend to the rest.

Replying to the discussion, Major Freeth said that there was a very great demand for more libraries and books. He certainly did not expect men to come from the universities and colleges "ready made," and he agreed that it was desirable that the prestige of the newer universities and of the technical colleges should be more nearly matched to that of the older universities.

Temperature Control

A Useful "A.B.C."

It is becoming universally recognised that the automatic control of temperature for space heating and for a wide variety of heating and cooling processes is essential for economy of plant operation. In a great many instances accurate temperature control is the final answer to the intensified fuel problem. During the war it has seemed almost as if the need for knowledge on the subject of temperature control has outstripped the supply of knowledge in the average industrial undertaking and service establishment. Consequently, there are not a few temperature control problems which have waited overlong for a solution. A series of papers is available which virtually tells the whole story of temperature control for heating and industrial purposes.

The new series of papers offers a timely opportunity to works engineers, works managers, students, and others, who are anxious to find out more about the various aspects of temperature control. It has been specially prepared by the technical staff of Sarco Thermostats, Ltd., Cheltenham, Glos., who make temperature control a special study. The papers are non-advertising and approach the subject in an entirely disinterested way. No charge is made for them, but the quantity available is limited, and interested readers are recommended to send their applications (direct to Sarco Thermostats, Ltd.) without delay.

Personal Notes

DR. ELMER K. BOLTON, chemical director of the Du Pont Company, has been chosen by the American Section of the Society of Chemical Industry as the next recipient of the Perkin Medal.

LT.-COL. IVOR FRASER has been appointed a director of W. J. Fraser & Co., Ltd., and MR. C. M. AUTY, B.Sc., M.I.Chem.E., technical director. Mr. Auty has been the company's senior process chemical engineer for ten years, and will continue to be mainly responsible from the process and research sides of the company's activities.

MR. ARTHUR W. SLOAN, released by the B. F. Goodrich Co., has arrived in Egypt to act as director of chemical commodities for the U.S. Foreign Economic Administration, Middle Eastern Area. He will be responsible for recommending the allocation of U.S. chemical products in that zone.

DR. DOUGLAS A. ALLAN, Ph.D., D.Sc., director of the Liverpool Public Museums, since 1929, is to succeed Mr. Thomas Rowatt, O.B.E., M.M., M.I.Mech.E., as director of the Royal Scottish Museum, Edinburgh, on January 1. Dr. Allan, who is an Edinburgh man, was for a time during the last war one of the late Sir James Walker's team of young chemists working on a novel process for making TNT. Later he transferred his allegiance to geology, and from 1921 to 1929 taught geology at Edinburgh University and at Armstrong College.

Obituary

We regret to announce the death, on December 16, of LADY PICKARD, wife of Sir Robert Pickard, F.R.S., past president of the Royal Institute of Chemistry and director, until earlier this year, of the British Cotton Research Institute.

DDT in Paint

Manchester Meeting

AT a meeting of the Oil and Colour Chemists' Association held in Manchester on a recent occasion, Mr. G. A. Campbell read a paper written by himself and Dr. T. F. West dealing with "Some Possible Paint Applications of DDT."

The first part of the paper dealt with the background of research out of which DDT has emerged. The authors then described its successful use, in the form of a spray, in the campaign against flies; walls sprayed with it killed these pests even up to two months afterwards. This persistency raised the question of incorporating DDT in paints and other durable surface coating. Good results were obtained when incorporated with dry distemper and oil-bound water paint. Oil-bound water paint was found to remain effective after six months.

Results from the incorporation of DDT with oil paint and enamel have, so far, been negative, but the authors believe that there are good prospects of a successful formulation in these more durable paints.

Parliamentary Topics

Fuel Research

IN the House of Commons last week, Mr. Salt asked the Lord President of the Council what was the present position with regard to the co-ordination of coal utilisation research; whether the Joint Standing Committee on Research, of which Sir Harold Hartley is chairman, was the appropriate body to undertake such co-ordination; how many meetings of this committee had been held; and whether it was proposed to issue a report.

Major Lloyd George, who replied on behalf of the Lord President, said that the Standing Consultative Conference on Fuel Research was set up expressly to promote the co-ordination of all aspects of fuel research, including coal utilisation. It is composed of representatives of the Government organisations and industrial research associations concerned. The Conference itself has held two meetings and a number of meetings of its Committees have been held. It is not proposed, at this stage, to issue any report.

Mr. Salt also asked the Lord President whether arrangements could now be made for the Fuel Research Station to undertake the testing of coal-using appliances of all kinds.

Major Lloyd George: Testing of many types of fuel-using appliances is already undertaken by the Fuel Research Station.

Patent Interchange Agreement

The Minister of Production replied affirmatively to Sir Alfred Beit when he asked whether any restrictions in connection with commercial exploitation or advertising were imposed and agreed upon when plans and drawings of British inventions or devices were offered to the U.S.A. with the object of furthering the war effort by manufacture in that country.

Synthetic Rubber

Mr. I. Thomas asked the Minister of Production what stage had been reached in the production of synthetic rubber in this country; and, in particular, whether the British company to which a permit was granted in 1943 had begun production.

Mr. Lyttelton: There has not as yet been any commercial production of general purpose synthetic rubber in this country. The plant referred to is still under construction.

General News

Specification DTD 916, dealing with hard chromium plating of steel, has been issued by the Ministry of Aircraft Production.

The Control of Iron and Steel (No. 36) Scrap Order, 1944 (S.R. & O. 1944, No. 1335) removes the obligation to segregate scrap steel containing tungsten.

Seven new Fellows have been elected to the Institute of Physics, as well as 21 new Associates, seven Subscribers and 38 Students.

A gift to found a prize for students' research in the department of chemistry has been made by Professor W. E. S. Turner, head of the department of glass technology at Sheffield University.

The gift of £45 from war workers of I.C.I., Ltd., "somewhere in Scotland," is recorded in the latest published list of contributions to Lady Cripps's United Aid to China Fund.

The Liverpool office of the Deputy Raw Materials Regional Officer has been closed. Matters hitherto dealt with at that office are transferred to the office of the Raw Materials Regional Officer, Britannia House, Fountain Street, Manchester, 2.

Fuel Research Coal Survey No. 57 (H.M.S.O., 2s.) is a report on the analysis of 213 commercial grades of coal in the Notts and Derby area. The Survey is an activity of the D.S.I.R., which aims at the utilisation of the national coal resources to the best advantage.

The Scottish fuel engineers who have been assisting the Ministry of Fuel's Efficiency and Economy Committee on a voluntary basis are asking the Coal Production Board for Scotland, consisting of equal representation from the owners and miners, to take action to secure cleaner coal.

The urgent necessity of storing acetylene away from inflammable liquids was driven home by a fatal accident which occurred in a garage at Bedfont, Middlesex. Alexander Stewart, a 30-year-old workman in the garage, was killed when petrol leaking from a lorry he was repairing caught fire and exploded two acetylene containers.

Two further memoranda have just been issued by the A.Sc.W.: "Science and the Real Freedoms," containing articles by Sir Robert Watson-Watt and by Dr. A. H. Bunting; and "Part-Time Scientific and Technical Education," giving interesting results of a recent inquiry made by the Association. Copies may be obtained, at 3d. each, at Hanover House, High Holborn, W.C.1.

From Week to Week

Wholesale prices in November showed little change from October, according to the Board of Trade Index Numbers. Industrial materials and manufacturers rose by 0.1 per cent., from 172.2 to 172.4 (1930=100). The rise under the head "Chemicals and Oils" was also 0.1 per cent., from 151.6 to 151.7, and was due to the seasonal advance in the price of fertilisers.

Keith Piercy, Ltd., announce that from January 1, 1945, their business, which consists of the supply and technical servicing of Calgon and other phosphates used in water treatment, will be carried on under the name of their parent company, Albright & Wilson, Ltd., chemical manufacturers, Oldbury, Birmingham. This is being done in order to simplify sales office organisation. The change is one merely of name and there will be no alteration in policy or staff.

Foreign News

A dyestuffs research laboratory has been established by the American Viscose Corporation at its New York offices.

The requirement that laboratory and surgical glassware, on importation into Canada, be marked with an indication of the country of origin has been cancelled.

External treatment with a melamine plastic is being used by the U.S. Army to render cotton-rayon and other fabrics water-repellent.

To place the Indian mica industry on a sound post-war footing, the Government of India is to set up a committee of inquiry which will deal with the industry's problems.

Aluminium production is expected to start shortly at Wangaratta, Victoria, Australia, based on bauxite from the Gippsland district. The output will go into aircraft manufacture.

A contract has been signed between the Governments of Chile and the United States for the purchase by the latter of 700,000 tons of nitrate of soda at a price between $21 and $22.25 per ton f.o.b. Chile.

The Emeryville Chemical Co., San Francisco, has been bought by the Diamond Alkali Co., of Pittsburgh. The manufacture of silicates will be continued at the Emeryville plant.

The University of Toronto is appealing to raise some $5,000,000 for post-war expansion in equipment and buildings. A new building for the Department of Chemical Engineering and an extension to the Department of Chemistry and to the Banting Institute are being planned.

Negotiations regarding the establishment of a large aluminium plant in Mexico City, to be operated with aluminium from Canada, are in progress between representatives of the Aluminium Co. of Canada and a Mexican firm.

Experiments with waxes, lacquers and varnishes, with a view to developing types that will have a toxic effect on fungi, are to be carried on at the fungus farm recently established by the General Electric Company at Schenectady, New York.

Glyco Products Co., Inc., Brooklyn, New York, is opening a factory in Mexico City named Productos Químicos Glyso. S.A., located at Cipres, to manufacture many products of the present company, especially those based on Mexican raw materials.

Official figures relating to the value of mineral production in Peru in the year 1943, just published, give the total as valued at 232,922,163 soles, and made up of copper, gold, lead, silver, zinc, bismuth, tungsten, vanadium, antimony, molybdenum, mercury and cadmium.

To further research into the cultivation, extraction and uses of tung oil, the Universal Trading Corporation (the Chinese Government's official buying and selling agency in the U.S.) has made an initial contribution of $30,000 in laboratory equipment in China.

The University of Melbourne, says *The Times*, has received from Mr. W. Russell Grimwade, chairman of the directors of Drug Houses (Australia), Ltd., and a member of the Council of the University, a gift of £A50,000 for the foundation of a school of biochemistry.

Phthalic anhydride to the amount of 7,000,000 lb. annually is expected to be produced at the new plant which the Koppers Company is erecting at Kobuta, Pa. (U.S.A.), with the intention of opening next spring. The anhydride is to be used as an insect repellent in jungle warfare and elsewhere.

Garfield Chemical & Manufacturing Company, a subsidiary of the Utah Copper Company, and the American Smelting & Refining Company, Salt Lake City, Utah, have received approval by the W.P.B. for construction of a sulphuric acid plant with a daily capacity of 150 tons at Garfield, Utah, at an estimated cost of $1,000,000.

The most recent development in the production of fluorescent maps for night-flying, etc., is the use of a high wet strength fluorescent paper printed with ordinary lithographic inks, according to Lieut.-Commander P. A. Smith, chief of the Aeronautical Chart Branch, U.S. Geodetic Survey.

A former jungle area near the town of Nicaro, Cuba, is now producing 5000 tons of nickel ore a day. The ore, lying on the surface for a depth of from 12 ft. to 50 ft., contains 45 per cent. iron, some chromium and cobalt, and from 1 to 3 per cent. nickel. The deposit is being worked by the Nicaro Nickel Company on behalf of the United States Metals Reserve Corporation.

Dimethyl-ethanolamine and allyl alcohol are among the organic compounds now produced on a commercial scale in the U.S. by Carbide and Carbon Chemicals. The ethanolamine is of value in the synthesis of corrosion inhibitors, acetate rayon dyestuffs and lubricants. Allyl alcohol, which has been released from priority, may become of economic value as an intermediate for industrial chemicals.

Those concerned with the use of measuring instruments and controls should be interested in the Leeds & Northrup Company's recent publication (Folder ENT 7a), which briefly describes and illustrates all the company's instruments for regulating plant processes. Copies may be obtained on application to Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pennsylvania, U.S.A.

The list of items for which a Venezuelan import licence is necessary has been reduced by a decree dated November 18. Among chemical and allied products the following still require an import licence: asbestos, magnesite, alkaline bases, sodium bicarbonate, sodium carbonate, sodium sulphate (Glauber salts), calcium hypochlorite (chloride of lime), pharmaceutical products, perfumery, soap products, paints, varnishes and lacquers, glass flasks or bottles.

Unusually rich niobium ore deposits are reported to have been discovered in the Vishnevi Mountains of Soviet Russia. A shaft is already being sunk, and an experimental plant is under construction for the preparation of niobium concentrate. It is expected that before the end of the year hundreds of tons of ore will be processed into concentrates. There is no mention of tantalum, which usually occurs in association with niobium.

Cautious optimism is the keynote of the report of Mr. S. R. L. Shepherd, geologist to the Queensland Mines Department, on the possibilities of the wolfram on Banks Island, in Torres Strait. Whereas crystallised wolfram free from other metallic minerals occurs in good quantity in several quartz lodes, the report calls attention to the sporadic distribution of wolfram in quartz, and the fact of the usual accumulation of wolfram on or near the surface.

Forthcoming Events

The **Association for Scientific Photography** meets at Caxton Hall, S.W.1, on **December 30,** at 2.30 p.m., when papers on "The Choice of Materials for Scientific Photography," will be read by Dr. H. Baines and Mr. F. J. Tritton.

The Society of Chemical Industry meets on **January 1,** at 2.30 p.m., at Burlington House, to hear a paper on "Hydrogen Peroxide and Related Compounds in Industry," presented by Mr. V. W. Slater.

The next meeting of the Birmingham section **Electrodepositors' Technical Society** will take place at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, on **January 2,** at 6 p.m., when a paper on "Black Finishes for Steel" will be presented by Mr. H. Silman.

The Royal Institute of Chemistry is holding the following Christmas lectures for children: at 2.15 p.m. in the Town Hall, Birmingham, on **January 2**, "Fire," and, on **January 5**, "Science in Antiquity." Both lectures will be given by Dr. J. A. Newton Friend.

The **British Association** announces a conference of its Division for the Social and International Relations of Science on "The Place of Science in Industry," to be held on **January 12** and **13** at the Royal Institution, Albemarle Street, London, W.1. The conference will be opened by Sir Richard Gregory, President of the Association, and there will be four sessions, at which the chair will be taken respectively by Mr. Ernest Bevin, Lord McGowan, Sir John Greenly and Lord Woolton. The subjects of the sessions will be: what industry owes to science, fundamental research in relation to industry, industrial research and development, and the future—what science might accomplish. A limited number of tickets will be available for the public, other than members of the Association, and may be applied for at the office of the British Association, Burlington House, London, W.1.

Company News

The Distillers Co., Ltd., maintains its interim dividend at 6¼ per cent.

Cape Asbestos, Ltd., is paying an interim dividend of 2½ per cent. (same).

Asiatic Petroleum Company (North China), Ltd., has changed its name to Shell Company of China, Ltd.

Amal, Ltd. (subsidiary of I.C.I., Ltd.), reports a net profit to July 31 of £18,835 (£21,635). The ordinary is maintained at 15 per cent.

Power-Gas Corporation, Ltd., records a net profit for the year to September 30 amounting to £59,457 (£89,284). The dividend of 10 per cent., plus a bonus of 2½ per cent., is maintained.

Associated Manganese Mines of South Africa, Ltd., announce that no ordinary dividend is to be paid for 1944, as against 17½ per cent. for 1943 and 25 per cent. for 1942.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

IODRESS, LTD., London, E.C., iodine dressing manufacturers. (M., 23/12/44.) November 25, debenture to Anglo-Federal Banking Corporation, Ltd., securing all moneys due or to become due to the Bank; general charge. *£1000. December 10, 1943.

FREERS CHEMICAL WORKS, LTD., Reading. (M., 23/12/44.) November 27, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on contract moneys. *Nil. September 23, 1943.

New Companies Registered

Caustic-Soda, Ltd. (391,739).—Private company. Capital, £100 in 100 £1 shares. Objects and other particulars similar to Bi-Carb Soda, Ltd. (q.v.).

Bi-Carb Soda, Ltd. (391,738).—Private company. Capital, £100 in 100 £1 shares. Manufacturing, wholesale, retail and analytical chemists, etc. C. R. G. Young is the first director. A limited liability company may be appointed a director of this company. Registered office: 120/122 Victoria Street, S.W.1.

Chemical and Allied Stocks and Shares

OWING to holiday influences, stock markets were inactive and easier, British Funds showing small declines, and leading industrials also slightly lower where

changed. Nevertheless, good features were not entirely lacking. Tube Investments were prominent with a sharp advance to 106s. 10½d. on the statements at the meeting, particularly the references to the further extension of the activities of the group. Stewarts & Lloyds were firm at 55s. 5d., but the tendency in Richard Thomas at 13s. 3d., and in Baldwins at 6s. 10½d., became easier. Imperial Chemical were again around 39s. with Borax Consolidated 36s. 9d., and Nairn & Greenwich kept firm at 77s. 6d. awaiting the dividend. Dunlop rubber firmed up to 48s., and Wall Paper Manufacturers deferred were 44s. 3d. Although "ex" the maintained interim of 6¼ per cent., the units of the Distillers Co. were little changed at 107s. 9d., there being confidence that the total dividend is likely to be maintained at 18¼ per cent. for the current year with good prospects of a return to pre-war distributions after the war. The recent dividend announcement, and the possibilities of big post-war expansion in the light metal industries maintained firmness in Birmid Industries shares at 88s.

Among shares of concerns interested in plastics, British Industrial 2s. ordinary were steady at 7s. awaiting the results, with Erinoid firm at 11s. 9d., and De La Rue 192s. 6d. International Paint shares, however, became slightly less firm at 117s. 6d. Lewis Berger reacted slightly to 105s. 6d. but continued held firmly, it being realised that, although the dividend is again limited to 19 per cent., this was less than half the rate actually earned on the shares. British Oxygen reacted slightly to 88s., and United Molasses at 38s. 3d. also failed to hold best levels touched recently. Triplex Glass at 43s. 7½d., and Turner & Newall at 81s. 9d. xd., also reflected the inactive and easier trend of markets. British Plaster Board continued active and were around 38s. 3d. Associated Cement had a steadier appearance at 61s. 6d., with Metal Box 92s., and Pressed Steel 32s. 3d. Lever & Unilever became less firm at 46s. 6d. British Match kept steady at 42s. 6d., General Refractories 17s. 6d., Amalgamated Metal 17s. 7½d., Radiation 58s. 6d., and Babcock & Wilcox 53s. Ruston & Hornsby at 49s. 3d. held all but a small part of their recent advance, but Powell Duffryn showed a small decline at 23s. 6d. Murex ordinary shares continued at 100s. Elsewhere, Gas Light & Coke ordinary were 22s. 6d. Textiles lost part of earlier gains, with Bleachers reacting to 13s. 7½d. following the decision to leave the question of a further payment in respect of preference dividend arrears until results for the whole year are known. Calico Printers were 18s. 7½d., Bradford Dyers 25s., British Celanese 36s. 6d., and Courtaulds 57s 6d.

B. Laporte changed hands at 83s. 6d., while W. J. Bush were again 70s. Greeff-Chemicals 5s. ordinary were 8s. 3d., with Monsanto Chemicals 5½ per cent. preference again 23s., British Drug Houses 29s., and Burt Boulton 24s. Cellon 5s. ordinary were 24s. 3d., with William Blythe 3s. shares firm at 9s. 6d. In other directions, Boots Drug at 55s. 6d. have been well maintained, with Timothy Whites 46s., Sangers 29s. 7½d., and Beechams deferred 19s 7½d. Fisons at 52s. remained steady, as did United Glass Bottle at 70s., and Forster's Glass at 36s. Still under the influence of the higher dividend, Wailes Dove 5s. ordinary changed hands around 15s. 6d.

Oil shares were generally easier, Anglo-Iranian easing further, and Burmah Oil and "Shell" losing a few pence. No change is generally expected in the forthcoming interim dividend of the last-named company.

British Chemical Prices

Market Reports

FIRM price conditions have been reported in pretty well all sections of the London market this week. A fair amount of fresh inquiry is reported, but new bookings are not numerous, chiefly because of the supply position. Existing contracts are being drawn against steadily, and deliveries are well up to schedule. There has been a fair inquiry for the various grades of sulphide of soda, while there is an active call for supplies of soda ash and bicarbonate of soda. Both Glauber salt and salt cake are in good request, and strong prices are indicated for prussiate of soda, supplies of which are scarce. A fair trade is reported in percarbonate of soda. In the potash section supplies of caustic potash are moving steadily at fixed levels, and no change is announced in the price position of permanganate of potash, which is meeting with a steady demand. Acid phosphate of potash is a good market and supplies of yellow prussiate continue to be readily absorbed. In other directions hydrogen peroxide is being taken up in fair quantities, while buying interest in alum lump is on steady lines, with the market firm. A ready outlet continues for crude and refined glycerine, and white powdered arsenic is a strong section. In the acid section a steady trade is passing in oxalic acid, and supplies of citric and tartaric acids are finding a ready outlet. There is a moderate inquiry for hydrochloric acid. Conditions in the coal-tar products market remain quiet, with home users of pitch calling for fair tonnages, while a moderate trade is passing in the naphthas and xylols.

MANCHESTER.—Although the movement of

heavy chemical products into consumption in the Lancashire area, especially to the textile and allied trades, has been well maintained during the past week, there have been signs within recent days of a slackening both as regards new inquiries and actual business on the Manchester market and in the flow of delivery specifications. Relatively slow conditions may be expected to continue during the greater part of next week, though it is anticipated that there will be a steady recovery in the demand for the alkalis and other leading heavy chemicals. The market is firm in virtually all sections.

GLASGOW.—In the Scottish heavy chemical trade during the past week there has been no change in the home trade. Business is moderate. Export inquiries still remain rather restricted. Prices keep very firm.

In the diagram numbered Fig. 7a in Dr. Howat's article on Hydrogen Production (THE CHEMICAL AGE, December 16, p. 564), the third percentage figure in the two right-hand graphs (7 per cent. in each case), should refer to CO_2, not to CO.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

SITUATION VACANT

ASSISTANT Works Manager required for Chemical Works in Northern Ireland. Applicant must have had a sound chemical engineering training, and be able to control labour. Age 25-35. Good prospects for suitable man. Write giving full details and salary expected to Box No. 2194 The Chemical Age, 154, Fleet Street, London, E.C.4.

WANTED

WANTED regularly, Residues, Sludge, Slag, etc., containing Antimony, Cadmium, Copper, Lead, Nickel and Zinc. Oakland Metal Company Ltd., Willington, Derby.

WANTED.—Supplies of Nitre Cake in ten-ton lots. Box No. 2126 THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

WANTED, back numbers of this Journal as follows: 9th January and June 12th, 1943, also complete Index to 1943. Box No. 2195, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WANTED urgently, back numbers of THE CHEMICAL AGE, as follows:—
1944, August 19th.
1944, September 9th, 16th and 23rd.
1944, October 7th, 14th and 21st.
Please reply to THE CHEMICAL AGE, 154 Fleet Street, Loylon, E.C.4.

WORKING NOTICE

THE Proprietors of British Patent No. 528,240, for "ELECTROLYTIC PROCESSES AND BATHS," desire to enter into negotiations with a Firm or Firms for the sale of the Patent or for the grant of licences thereunder. Further particulars may be obtained from Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

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